

REMARKS

Claims 1-58 are pending in the application.

Claims 1-58 stand rejected.

Claims 1, 9, 12, 17, 24, 32, 35, 40 and 48 have been amended.

Rejection of Claims under 35 U.S.C. §101

Claims 40-55 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Applicant has amended claims 40 and 48 in harmony with the amendments suggested in the Office Action, and so respectfully submit the instant rejection to be overcome.

Rejection of Claims under 35 U.S.C. §102

Claims 1-58 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Uga, et al., U.S. Patent No. 6,718,326 B2 (Uga)

While not conceding that the cited reference qualifies as prior art, but instead to expedite prosecution, Applicant has chosen to respectfully disagree and traverse the rejection as follows. Applicant reserves the right, for example, in a continuing application, to establish that the cited reference, or other references cited now or hereafter, do not qualify as prior art as to an invention embodiment previously, currently, or subsequently claimed.

At the outset, Applicant respectfully notes the fundamental structure of the invention, as claimed in amended independent claims 1, 9, 17, 24, 32, 40 and 48, is generally directed to methods, systems network elements and so on, that employ a content-addressable memory that,

when presented with information from a packet, in turn presents an index to a multi-feature classification memory. Each of these memories stores respective information regarding the processing of a packet (an index into the multi-feature classification memory, in the case of the content-addressable memory, and one or more multi-feature packet processing rules, in the case of the multi-feature classification memory).

An example may prove illustrative. To begin with, packet processing rules are merged into multi-feature packet processing rules. The multi-feature classification memory is then populated with these multi-feature packet processing rules. The associated content-addressable memory (CAM) is populated with indices that correspond to one or more of the aforementioned multi-feature packet processing rules with which the multi-feature classification memory has been populated. When a given packet is received, the merged packet processing rules (the multi-feature packet processing rules) are given effect by the packet being supplied to the content-addressable memory, which then, in turn, generates an index into the multi-feature classification memory for the given set of packet processing features represented within the packet in question.

Thus, according to the claimed invention (as claimed in amended independent claims 1, 9, 17, 24, 32, 40 and 48), providing the first memory (e.g., the content-addressable memory) with information from a packet allows the first memory (e.g., the content-addressable memory) to provide an index that is then used to access one or more corresponding multi-feature packet processing rules stored in the second memory (e.g., the multi-feature classification memory). In so doing, the network device employing the claimed invention can then use appropriate ones of its features to perform appropriate processing on the packet. Advantageously, given that the requisite packet processing rules have been merged into one or more multi-feature packet

processing rules, the amount of memory needed to implement the claimed invention is significantly reduced, as compared to other techniques.

By contrast, Uga provides no such mechanisms. In Uga's system, once a match is found in Uga's content addressable memory, actions thus identified in Uga's system are stored in Uga's search result storage device. No indexing, as in the claimed invention, occurs in Uga. Uga's stated purpose, to allow for multiple portions of a bit width wider than Uga's CAM is capable of handling to be processed, a system according to Uga stores the results from each portion of the wide bit width in its search result storage device. Thus, by taking in such information piecemeal, Uga is able to handle wide bit widths by allowing its CAM to process each portion of the wide bit width separate, and so decide what processing each portion of the wide bit width is intended to produce.

Applicant therefore respectfully submits that Uga's search result storage device does not, in fact, anticipate the claimed multi-feature classification memory for several reasons. For example, the claimed content-addressable memory does not provide any of Uga's information to the claimed multi-feature classification memory for storage therein. Instead, the claimed content-addressable memory provides an index that allows one or more multi-feature packet processing rules to be identified, and so to allow processing of the given packet according to those multi-feature packet processing rules.

Moreover, Applicant respectfully submits that the claimed multi-feature classification memory does not receive anything comparable to Uga's actions and comparison information from the claimed content-addressable memory. Certainly, the claimed multi-feature classification memory does not store anything (index or otherwise) provided by the claimed content-addressable memory. These distinctions are highlighted by the following passages, and,

Applicant respectfully submits, are sufficient to distinguish the claimed invention from Uga, and so lead to the conclusion that the claimed invention is allowable over Uga.

This distinction is borne out by comparing the claimed invention with the system disclosed in Uga. Claim 1 recites:

1. A method of processing a packet comprising:
populating a plurality of multi-feature packet processing rules in a multi-feature classification memory; and
populating an associated content-addressable memory with a plurality of indices, wherein said indices are indices of said plurality of multi-feature packet processing rules in said multi-feature classification memory,
said content-addressable memory and said multi-feature classification memory are associated with one another by virtue of said content-addressable memory being coupled to provide an index of said indices to said multi-feature classification memory, and
each of said indices corresponds to at least one of said multi-feature packet processing rules.

Claims 9, 17, 24, 32, 40 and 48 now recite similar limitations, having been amended to refine the limitations that capture the distinctions discussed herein, as well as other limitations, as discussed subsequently. As will be appreciated, each of the independent claims clearly recites the fact that an index from the content-addressable memory is used to access packet processing rules for a plurality of features stored in a multi-feature classification memory via the claimed coupling between the two. As noted earlier, this is in marked contrast to the mechanisms described in Uga.

Uga describes a system that allows a CAM, having insufficient native bit width, to accommodate wider bit widths by taking in very long bit widths in a piecemeal fashion, storing the results in a search results storage device:

“A packet classification search device and method are implemented which are capable of searching rules of packet classification having very long search bit width at high speed while using a CAM which has a limited bit width. The fields of rules of packet classification are grouped into groups, and the grouped fields of each rule are stored along with search related information (except for the initial group) and number of searches information in a CAM. The next number of searches information (if further groups exist which must be searched), comparison related information, and actions related to packets (if further groups exist which must be searched, directing searching again, while if no further groups exist which must be searched, actions for packet classification) are stored in a search result storage device. By doing this it is made possible to search with the bit width of the group unit.” (Uga, Abstract)

Thus, as can be seen, Uga fails to provide for anything comparable to the claimed index. In the claimed invention, it is this index that is stored in the CAM, and provides a connection between the information carried in the packet and the features invoked by the claimed multi-feature packet processing rules. Moreover, it is this index that is provided to the claimed multi-feature classification memory to determine which one or more of the multi-feature packet processing rules is to be performed, and so which features of the given network device are to be

invoked. Lacking such a nexus, even if Uga taught the claimed multi-feature packet processing rules and indices corresponding thereto (which Applicant maintains Uga does not), no nexus between any two such units of information is taught by Uga.

It is noted in the Office Action that the following section of Uga is said to demonstrate that the search result storage device stores actions corresponding to said combinations of grouped fields, the number of searches information and search related information inputted to said content addressable memory. This section of Uga recites:

“...

a search result storage device which stores, in correspondence to said combinations which are stored in said content addressable memory, actions which are to be performed when combinations of grouped fields, number of searches information and search related information that have been inputted to said content addressable memory are found in said content addressable memory, and comparison related information which show the rules to search when next searching in said content addressable memory

...” (Uga, claim 1; Emphasis added)

Applicant fails to discern the manner in which the foregoing claim language anticipates the instant claims. As an initial point, Applicant fails to discern in the cited passages (or, in fact, anywhere else) in Uga where there is taught the use of an index between two memories coupled to one another. Moreover, Applicant further fails to discern in the cited passages (or, in fact,

anywhere else) in Uga where there is taught the use of “indices,” as clearly recited in Applicant’s claims.

Moreover, Applicant is at a loss to appreciate how the foregoing section of Uga teaches that the search result storage device stores actions corresponding to said combinations of grouped fields, the number of searches information and search related information inputted to said content addressable memory. First, the claimed “plurality of multi-feature packet processing rules” correspond to an index. Second, Applicant are at a loss to appreciate how the storage of actions corresponding to said combinations of grouped fields anticipates the claimed invention’s use of an index, regardless of how that index is created (and Applicant does not concede that any parallel can successfully be drawn in this regard).

Applicant further notes that the Office Action’s arguments with regard to claims 9, 17, 32 and 48 can simply be grouped with claims 1, 24 and 40. As can clearly be seen, while claims 9, 17, 32 and 48, and claims depending therefrom, recite limitations that are substantially similar to claims 1, 24 and 40 that distinguish over Uga, claims 9, 17, 32 and 48, and claims depending therefrom, also recite additional limitations that further distinguish these claims over Uga. This can be seen in the following reproductions of claims 1, 9 and 17:

1. A method of processing a packet comprising:
populating a plurality of multi-feature packet processing rules in a multi-feature classification memory; and
populating an associated content-addressable memory with a plurality of indices, wherein said indices are indices of said plurality of multi-feature packet processing rules in said multi-feature classification memory,
said content-addressable memory and said multi-feature classification memory are associated with one another by virtue of said content-addressable memory

being coupled to provide an index of said indices to said multi-feature classification memory, and
each of said indices corresponds to at least one of said multi-feature packet processing rules.

9. A method of processing a packet comprising:
identifying a classification of said packet in a content-addressable memory;
causing said content-addressable memory to provide an index of a plurality of indices to a multi-feature classification memory, wherein said index corresponds to said classification; and
locating a multi-feature packet processing rule in a multi-feature classification memory,
wherein
said locating uses said index, and
said content-addressable memory and said multi-feature classification memory are coupled to one another by virtue of said content-addressable memory being coupled to provide said index to said multi-feature classification memory.

17. A packet processing rule lookup system for processing a packet, comprising:
a multi-feature classification memory, wherein
said multi-feature classification memory is configured to store a plurality of multi-feature packet processing rules,
each of said multi-feature packet processing rules comprises a merged set of packet processing rules for at least one of a plurality of features, and
said each of said multi-feature packet processing rules allows said packet to be processed with regard to a set of said features corresponding to said each of said multi-feature packet processing rules; and

a content-addressable memory coupled to said multi-feature classification memory,

wherein

said content-addressable memory is configured to store a plurality of indices, and each of said indices corresponds to at least one of said plurality of said multi-feature packet processing rules.

Applicant respectfully submits that distinctions between the claims reproduced above militate towards a demonstration by the Examiner as to how Uga teaches these additional limitations (which, in fact, Applicant maintains Uga does not).

Applicant respectfully submits, therefore, that independent claims 1, 9, 17, 24, 32, 40 and 48 are allowable over Uga and Applicant respectfully urges the Examiner to withdraw the §102 rejection of claims 1-58, due to their dependency on their respective independent claims. Applicant further submits that dependent claims 2-8, 10-16, 18-23, 25-31, 33-39, 41-47 and 49-58 are allowable as depending upon allowable base claims in addition to being allowable for various other reasons.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the Examiner is invited to telephone the undersigned at 512-439-5084.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on April 9, 2007.

~~Attn:~~ Attorney for Applicant

4/9/07
Date of Signature

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